

Amendment Under 37 C.F.R. § 1.116
Migdal et al.
Appl. No. 09/203,894

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not D2
Cont.
dihydroquinoline or a polymer thereof, the ratio of the first antioxidant to the second antioxidant being from 1:99 to 99:1, and, optionally, at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants

REMARKS

In a telephone conversation with the Examiner on December 13, 2000, it was learned that, technically, the claims listed in the Appeal Brief filed October 27, 2000 were incorrect because they were based upon Appellants' Second Amendment Under 37 CFR § 1.116, which purported to amend the claims in the application as they would have been if Appellants' First Amendment Under 37 CFR § 1.116 had been entered. The Examiner advised Appellants' representative that this technicality could be corrected by filing a Third Amendment, in effect combining the contents of the First and Second Amendments Under 37 CFR § 1.116. Thus, the above amendments to the claims and specification are a combination of the amendments previously filed. In substance, the only change is a substitution of parentheses for square brackets in the structural formulae of claims 1 and 15. The following remarks are taken from, and are substantially identical to, Appellants' First Amendment Under 37 CFR § 1.116 in an effort to ensure that the record is complete. The only modification has been to substitute the term "Appellants" for "Applicants" where such originally appeared. Thus, the claims will now be in the condition Appellants believed

them to be at the time of filing the Appeal Brief.

Reconsideration of this Application is respectfully requested. Claims 1 through 5, 7, 8, 10 through 19, 21, 22, and 24 through 28 are pending in the application with claims 6, 9, 20, and 23 having been cancelled and claims 1, 7, 14, 15, 21, and 28 having been amended. Entry of these amendments is respectfully requested as it is believed they place the application in condition for allowance or in better condition for appeal.

The amendments to the specification have been made to correct typographical errors in the application as filed. Support for the amendment to page 4, line 6 appears in the specification as filed in claims 12, 14, 26, and 28. The amendment to page 5, lines 16-17 inserts "phenyl" where it was inadvertently omitted. This is technically obvious, since the paragraph in which it appears is a listing of secondary diarylamines and the N-isopropyl-N'-*p*-phenylenediamine that appears in the list is not a diarylamine.

The present invention is directed to a composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof.

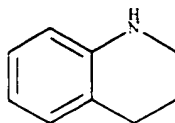
Claims 1- 28 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. taken with Meier et al., Evans, and Rasberger et al.

Jones et al. discloses a combination of oxidation inhibitors consisting of a mixture of hydrogenated quinolines and conventional types of oxidation inhibitors. The quinolines employed by Jones et al. comprised those having either the heterocyclic ring or both the heterocyclic and the

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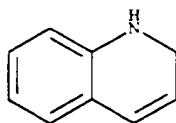
benzene rings of the compound *saturated* with hydrogen, for example, 1,2,3,4-tetrahydroquinoline and decahydroquinoline. See column 3, lines 1-6.

The basic ring structure of 1,2,3,4-tetrahydroquinoline is:



The second antioxidant of the present invention is 2,2,4-trialkyl-1,2-dihydroquinoline

The basic ring structure of this compound is



Thus, the compounds of the present invention have an additional double bond in the heterocyclic ring that is not disclosed or suggested by Jones et al. The claims of the present application have now been amended to point out with greater clarity the structure of the 2,2,4-trialkyl-1,2-dihydroquinolines that are used in the practice of Appellants' invention. Jones et al. simply do not teach such a structure or its use in lubricants.

None of the secondary references supplement this deficiency of Jones et al. According to the Examiner, Rasberger et al. have taught that 1,2-dihydroquinolines and 1,2,3,4-

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tetrahydroquinolines are interchangeable. This is in error.

The invention of Rasberger et al. was directed to improving the performance of a particular kind of antioxidant combination: 1,2-dihydroquinolines and phenolics. They found that when 1,2,3,4-tetrahydroquinolines were used *with phenolics*, the combination provided excellent antioxidant action along with satisfactory corrosion behavior. In other words, they did not teach that the 1,2-dihydroquinolines were interchangeable with 1,2,3,4-tetrahydroquinolines, but, rather, that the 1,2,3,4-tetrahydroquinolines were superior to the 1,2-dihydroquinolines *when used with phenolics*.

The Examiner has argued that interchangeability is not the same as equivalence; however, she has failed to provide any support for this argument. Webster's Third New International Dictionary (Unabridged) defines "interchangeable" as meaning "permitting mutual substitution without loss of function or suitability." The same dictionary defines "equivalent" as meaning "corresponding or virtually identical esp. in effect or function." It is submitted that these two words are synonymous and that the Examiner's position that there is some significant difference between them - making Appellants' arguments fallacious and erroneous - is clearly untenable.

Rasberger et al. make no mention of 1,2-dihydroquinolines except in the discussion of the prior art in column 1 at lines 22-34. The designation "2,2,4,7-tetramethyl-1,2,3,4-dihydroquinoline" is given in column 2, at line 59, but it is clear from the context that this is a typographical error and that "tetrahydroquinoline" was intended.

Further, Rasberger et al. do not confirm the present day use of tetrahydroquinolines with

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diarylaminos *or* phenols, as alleged by the Examiner. Rather they teach, as one possibility, the combination of tetrahydroquinolines with diarylamines *and* phenols. See column 4, lines 55 to 69.

Finally, as pointed out above, neither Meier et al. nor Evans disclose using 1,2-dihydroquinolines in combination with a diarylamine, they speak only of the combination of 1,2,3,4-tetrahydroquinolines with various other additives, including diarylamines. The Evans reference, in fact, shows that dihydroquinone derivatives and tetrahydroquinone derivatives are patentably distinct. See column 1, lines 9-57.

Additionally, Meier et al. only discloses 1,2,3,4-tetrahydroquinolines wherein the ring nitrogen atom is substituted, i.e., a tertiary amine. The present claims have been amended to be clearly directed to 1,2-dihydroquinolines in which the ring nitrogen atom is unsubstituted, i.e., a secondary amine.

Accordingly, it is requested that the rejection of claims 1-28 under 35 U.S.C. 103(a) as being unpatentable over Jones et al. taken with Meier et al., Evans, and Rasberger et al. be withdrawn.

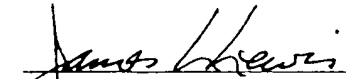
In view of the foregoing, it is submitted that this application is in condition for allowance.

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and an early Office Action to that end is earnestly solicited

Respectfully submitted,

12/13/00
Date

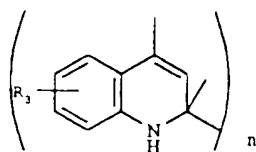

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APPENDIX

1. A composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula R_1-NH-R_2 , where R_1 and R_2 each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:



where $n=1-1000$ and R_3 is hydrogen, alkyl, or alkoxy.

2. The composition of claim 1 wherein the lubricating oil is selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, and polyoleates.
3. The composition of claim 1 wherein the lubricating oil is an API Group I base oil.
4. The composition of claim 1 wherein the lubricating oil is an API Group II base oil.
5. The composition of claim 1 wherein the lubricating oil is an API Group IV base oil.

7. The composition of claim 1 wherein the first antioxidant is selected from the group consisting of diphenylamine, monoalkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or di-nonyl-diphenylamine, phenyl- α -naphthylamine, phenyl- β -naphthylamine, diheptyldiphenylamine, mono- and/or di-(α -methylstyryl)diphenylamine, mono- and/or distyryldiphenylamine, 4-(*p*-toluenesulfonamido)diphenylamine, 4-isopropoxydiphenylamine, *t*-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated *t*-butyl-*t*-octyldiphenylamines, N-phenyl-1,2-phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-phenyl-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine.
8. The composition of claim 1 wherein the second antioxidant is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof.
10. The composition of claim 8 wherein the amount of 2,2,4-trimethyl-1,2-dihydroquinoline or polymer thereof is in the range of about 0.01 to about 10 weight percent.
11. The composition of claim 1 wherein the amount of secondary diarylamine is in the range of from about 0.01 to about 10 weight percent.

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12 The composition of claim 1 wherein the ratio the first antioxidant to the second antioxidant is from 1:99 to 99:1.

13 The composition of claim 1 further comprising at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

14 A composition comprising:

a lubricating oil selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, polyoleates, an API Group I base oil, an API Group II base oil, and an API Group IV base oil,

from about 0.01 to about 10 weight percent of at least one first antioxidant selected from the

group consisting of diphenylamine, monoalkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof,

3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or

di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or

di-nonyl-diphenylamine, phenyl- α -naphthylamine, phenyl- β -naphthylamine,

diheptyl-diphenylamine, mono- and/or di-(α -methylstyryl)diphenylamine, mono- and/or distyryl-diphenylamine, 4-(*p*-toluenesulfonamido)diphenylamine,

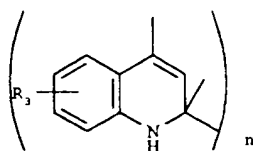
4-isopropoxydiphenylamine, t-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated t-butyl-t-octyl-diphenylamines, N-phenyl-1,2-phenylenediamine, N-

phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-phenyl-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine,

from about 0.01 to about 10 weight percent of a second antioxidant that is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof, the ratio of the first antioxidant to the second antioxidant being from 1:99 to 99:1, and, optionally,

at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants

15. A method of increasing the oxidation stability of a lubricating oil comprising adding thereto at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula R_1-NH-R_2 where R_1 and R_2 each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure



where $n=1-1000$ and R_3 is hydrogen, alkyl, or alkoxy.

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16. The method of claim 15 wherein the lubricating oil is selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, and polyoleates.
17. The method of claim 15 wherein the lubricating oil is an API Group I base oil.
18. The method of claim 15 wherein the lubricating oil is an API Group II base oil.
19. The method of claim 15 wherein the lubricating oil is an API Group IV base oil.
21. The method of claim 15 wherein the first antioxidant is selected from the group consisting of diphenylamine, mono-alkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or di-nonyl-diphenylamine, phenyl- α -naphthylamine, phenyl- β -naphthylamine, diheptyldiphenylamine, mono- and/or di-(α -methylstyryl)diphenylamine, mono- and/or distyryldiphenylamine, 4-(*p*-toluenesulfonamido)diphenylamine, 4-isopropoxydiphenylamine, t-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated t-butyl-t-octyldiphenylamines, N-phenyl-1,2-phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-phenyl-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-

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phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine.

22. The method of claim 15 wherein the second antioxidant is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof

24. The method of claim 22 wherein the amount of 2,2,4-trimethyl-1,2-dihydroquinoline or polymer thereof is in the range of from about 0.01 to about 10 weight percent

25. The method of claim 15 wherein the amount of secondary diarylamine is in the range of about 0.01 to about 10 weight percent.

26. The method of claim 15 wherein the ratio the first antioxidant to the second antioxidant is from 1:99 to 99:1.

27. The method of claim 15 further comprising at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

28. A method of increasing the oxidation stability of a lubricating oil selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, polyoleates, an API Group I base oil, an API Group II base oil, and an API Group IV base oil, comprising adding thereto from about 0.01 to about 10 weight percent of at least one first antioxidant selected from the group consisting of diphenylamine, mono-alkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or di-nonyl-diphenylamine, phenyl- α -naphthylamine, phenyl- β -naphthylamine, diheptyl-diphenylamine, mono- and/or di-(α -methylstyryl)-diphenylamine, mono- and/or distyryl-diphenylamine, 4-(*p*-toluenesulfonamido)-diphenylamine, 4-isopropoxydiphenylamine, *t*-octylated *N*-phenyl-1-naphthylamine, mixtures of mono- and dialkylated *t*-butyl-*t*-octyl-diphenylamines, *N*-phenyl-1,2-phenylenediamine, *N*-phenyl-1,4-phenylenediamine, *N,N'*-diphenyl-*p*-phenylenediamine, *N,N'*-di(naphthyl-2)-*p*-phenylenediamine, *N*-isopropyl-*N'*-phenyl-*p*-phenylenediamine, *N*-(1,3-dimethylbutyl)-*N'*-phenyl-*p*-phenylenediamine, *N*-(1-methylheptyl)-*N'*-phenyl-*p*-phenylenediamine, and *N*-cyclohexyl-*N'*-phenyl-*p*-phenylenediamine, from about 0.01 to about 10 weight percent of a second antioxidant that is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof, the ratio of the first antioxidant to the second antioxidant being from 1:99 to 99:1, and, optionally, at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

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